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ABSTRACT

Three papers consider various aspects of the labor market in the telecommunications field in the United States. The first, "Employment and Worker Dislocation in Telecommunications Equipment" (Julie Gorte, Office of Technology Assessment), notes that the increasing importance of international trade in the American economy has meant both a downward pressure on employment, as lost manufacturing jobs are not being replaced by the high technology sector jobs (including telecommunications), and an upward pressure on skills and education in telecommunications equipment and in manufacturing in general. The text is supplemented by several graphs, and is extensively footnoted. The second paper, "Communications Employment: Who Wins, Who Loses" (Joseph Anderson and Suzanne Harris, ICF Incorporated), assesses market and employment trends in the United States through 1995 in the telecommunications field and in communications-related sectors of other industries. The text is supplemented with three tables. The third paper, "The Telecommunications Industry, Contingent Workers, and the House of Labor" (Richard Belous, The Conference Board), examines the structure of emerging employment in the telecommunications field, and notes that many of the new jobs being created will be filled by "contingent workers," i.e., workers who have only a weak affiliation with a major company in the industry. It is concluded that this strategy will permit many telecommunications firms to reduce labor costs and increase productivity, but will also create new problems, including increased resentment by some workers and managers, and by labor unions. The text is supplemented by various tables and figures, and six footnote citations are provided. (Author/EW)

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TELECOMMUNICATIONS POLICY RESEARCH CONFERENCE
Communication & Future Employment Trends Section

Airlie, Virginia

September 27-30, 1987

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Julie Fox Gorte: International Trade and Employment in Telecommunications

The increasing importance of trade in the American economy and the rise in the trade deficit are major causal factors behind the decline of manufacturing employment since 1979, and behind the displacement of more than 2 million workers each year since 1979. The pressure of foreign competition - in the U.S. market as well as overseas - from a larger group of competitor firms and nations may cost jobs directly, or increase the pressure to automate production. Falling exports, rising imports and automation all put a damper on employment growth. The effects are particularly noticeable in manufacturing, which accounts for about 70 percent of U.S. trade.

Many analysts expected that high technology industries would be less likely to suffer from the pressures of international trade and competition, but high technology industries, including telecommunications equipment, have not proven as resilient as some hoped. Indeed, workers in electrical and electronic equipment (the industrial category that includes representation in the workforce. There is little question that rapidly increasing imports of telecommunications exports increased about 29 percent, while imports rose 140 percent, leaving the U.S. with a deficit in telecommunications equipment trade of \$3.9 billion. Over the same period, employment in Telephone and Telegraph Apparatus (SIC 3661) decreased by over 42,000.

The other important impact of international trade on employment in telecommunications equipment is the striking shift away from production employment and towards white collar, professional and technical employment. In telecommunications equipment, the proportion of production workers (most of whom are semiskilled or unskilled) has dropped from 67 percent to 58 percent between 1981 and 1987. As trade expands, workers will have to acquire more skills and education,

throughout their careers, to maintain stable worklives. In short, the expansion of trade, and trade deficits, has meant downward pressure on employment and upward pressure on skills and education in telecommunications equipment and in manufacturing in general.

Employment and Worker Dislocation in Telecommunications Equipment

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Julie Fox Gorte

Julie Gorte*

Introduction

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In June 1987, for the first time in the 1980s, the U.S. unemployment rate dropped to 6 percent. The number of people counted as unemployed dropped below 7.3 million (down from 8.3 million in 1986), and the United States entered its 19th quarter of economic growth, a very respectable record for the post-World War II period. At the same time, both the House of Representatives and the Senate were moving forward on legislation to nearly quintuple the money spent reemploying displaced workers, from about \$200 million to nearly \$1 billion.¹ This is not necessarily as inappropriate as it first appears, although the proposal has drawn its share of criticism.

According to one member of a recent task force on worker dislocation, the problems of displaced workers are overblown, and federal programs to aid them are a waste of resources. Moreover, dislocated workers are only a small proportion of the unemployed, and are generally better off than the disadvantaged people that constitute the majority of the long-term unemployed.

But there is another view. Even with sustained economic growth and falling unemployment rates, there is reason for concern. The fact that the unemployment rates has only just dropped to 6 percent, after the longest sustained period of economic growth in postwar history, is not particularly heartening. We should have been able, some argue, to drive unemployment much lower after such a long recovery. Starting from such a high base, un-

* The author is a senior analyst and project director at the Office of Technology Assessment. The views expressed here are her own, and not necessarily those of OTA.

¹ Normally, the largest program for dislocated worker reemployment is Title III of the Job Training Partnership Act. Title III has been funded at about \$220 million per year but in Program Year 1986 was cut to \$100 million due to a large carryover of unspent funds. Reasons for the large carryover of funds are discussed in Congress of the United States, Office of Technology Assessment, Technology and Structural Unemployment: Reemploying Displaced Adults, OTA-ITE-250 (Washington, D.C.: U.S. Government Printing Office, February 1986), pp. 186-189.

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employment rates in the next recession could dip back into double digits, a state which is becoming commonplace for some European and less developed nations but which is viewed with much consternation in America.

Apparently, structural unemployment has risen in America, and our inability to reduce unemployment rates more during the economic recovery since 1982 is evidence. It is quite possible for relatively high rates of worker displacement and economic growth to coexist, although at some level the two are not consistent.

Another source of concern is the changing composition of unemployment and displacement. The composite of industrial employment in America is, like all collages, a mix of good news and bad. In the early 1980s, during a period of economic recession and uncertainty, we were often confidently assured that growth in high-technology industries would make up for the declines suffered in smokestack sectors, or that the transformation to a "post-industrial" economy necessarily meant the decline of manufacturing. Interfering with the normal processes of economic growth and decline, or creative destruction, would rigidify the economy, leaving it with little ability to respond to changes in economic conditions and technology. In many ways, this view is correct: history is replete with examples of industrial succession. The automobile industry, for instance, replaced the buggy-making industry, plastic grocery bags are fast replacing paper, and the hand-held calculator has made the slide rule an anachronism.

But the view presented above has some questionable aspects as well. First, employment and industrial performance are not synonymous. Shrinking employment is not always a signal of industrial decline, and growing employment is not necessarily a consequence of industrial growth. Particularly now, with heightened interest in industrial automation and production reorganization, it is not uncommon for productivity growth to exceed growth of production, and for employment to shrink in industries that are growing modestly.

Second, high-technology industries may or may not replace smokestack industries. With a wider field of competition, including many newly industrializing countries, and many of our competitors using techniques we view as unfair, the ability of high-technology industries to replace traditional sectors *in America* is not assured. While there is no question that service sectors are growing, much of their growth is stimulated by man-

ufacturing, and the potential growth of service sectors *without* manufacturing is unknown. Is this a post-industrial economy? Perhaps, but only if the term "post-industrial" is left uncomfortably vague.

Greater precision is needed. To wit: employment in manufacturing is shrinking. Manufacturing employment, as a percentage of employment, peaked in 1944, at just over 40 percent of the workforce. In absolute numbers, manufacturing employment hit what seems to be destined to be its all-time high in 1979, at just over 21 million workers. Manufacturing employment edged above 19 million in mid-1987, but few expect it to go much higher. In terms of employment, then, it is clear that we are more than four decades past our industrial peak. However, employment is not necessarily the best measure of economic success; if it were, we would be even more concerned about the performance of our high-technology industries, including telecommunications.

Employment in high-technology industries has not expanded to fill the gaps left by shrinking employment in traditional manufacturing. Between 1980 and 1987, employment in high-technology sectors hardly changed, shrinking slightly from 6.2 million to 6 million.² Over the same seven years, U.S. civilian employment increased 13 percent (13.1 million people), and manufacturing employment fell by over 1 million. So, while high technology industries (most of which are in manufacturing) have performed better in terms of job creation than manufacturing as a whole, they have not added much to overall employment.

Employment in high technology industries is subject to many of the same pressures as traditional manufacturing. International competition--both in export markets, and at home--is getting stiffer. There is increasing pressure to automate. This is just as true of the steel and automobile industries as of computers and telecommunications. There is little question that the outlook for employment in the steel and automobile industries is for continued erosion. Is this also the future of telecommunications?

²These numbers pertain to the definition of high technology industries termed BLS (Bureau of Labor Statistics) Group 3. Industries classified as high technology according to this definition had to have a proportion of technology-oriented workers greater than the average for all manufacturing industries, and R&D-to-sales ratio had to be near or greater than the average for all industries. Employment figures apply to industries classified as high technology according to this definition in 1980.

The outlook for the telecommunications market is substantially different than it is for steel and automobiles. Unlike many traditional manufacturing sectors, which face global overcapacity, the outlook for telecommunications is for continued growth. According to The U.S. Department of Commerce, industry shipments are expected to grow at an annual rate of 9 percent, in real (deflated) terms, for the next five years.³ Growth in output, however, may not translate into growth in employment. For employment to grow, domestic production must grow faster than productivity and imports. Domestic production, in turn, can grow only if domestic manufacturers (which includes some foreign multinationals) maintain their competitiveness relative to offshore producers. Even if they do, employment growth is not an assured outcome.

What does seem certain is that the mix of skills and education required by the industry will continue to shift toward the white collar, professional and technical end of the spectrum. Production work, particularly that which is unskilled and semiskilled, is vulnerable both to cheap foreign labor and to automation. This pattern is broadly representative of manufacturing, in which the ratio of production workers to total employment has fallen from over 80 percent in 1950 to about 68 percent in 1987. Professional and technical workers and managers, on the other hand, have increased from 17.3 percent of U.S. employment to 27.3 percent. In high technology industries, the pattern is even more pronounced: production workers account for less than 50 percent of high technology employment, and the trend is still downward. As we have seen over the past few years in the semiconductor and computer industries, production workers may be vulnerable to displacement even while total industry employment is growing.

Worker Displacement in the United States

Approximately 2 million American workers lose their jobs each year through no fault of their own. Between 1981 and 1986, 10.8 million workers were displaced as a result of plant shutdowns or relocations, rising produc-

³U.S. Department of Commerce, International Trade Administration, 1987 U.S. Industrial Outlook: Prospects for Over 350 Industries, (Washington, D.C.: U.S. Government Printing Office, January 1987), p. 30-7.

tivity, or shrinking output⁴. Half of these workers are from manufacturing, although it accounts for less than 19 percent of the workforce. Industries that were hardest hit by international competition and imports generally experienced the greatest displacement. Since manufacturing as a whole is harder pressed by international competition than services, it is no surprise to see manufacturing workers disproportionately represented among the displaced.

Every manufacturing industry experienced displacement in numbers disproportionate to its representation in the workforce (Table 1). The hardest hit industries were nonelectrical machinery (an industry classification that includes office and computing equipment), primary metals, transportation equipment, electrical machinery (which includes communication equipment), and fabricated metals, in that order. Interestingly, the electrical machinery industry (which includes, among other things, electric distributing equipment, household appliances, electric lighting and wiring equipment, radio and TV receiving equipment, communication equipment, and electronic components and accessories) was harder hit, between 1981 and 1986, than the automobile industry. In part, this is because the first wave of worker displacement hit automobiles earlier, in 1980.

Clearly, the high technology industries are not strangers to worker displacement. Since the BLS surveys of worker displacement were conducted, employment has risen modestly in manufacturing as a whole; however, employment losses have continued in many high technology sectors, including telecommunications equipment. Between May 1986 and May 1987, employment has fallen by more than 23,000 workers in communication equipment; in telephone and telegraph apparatus (SIC 3661, the industry designation closest to telecommunications equipment) employment has

⁴Francis W. Horvath, "The Pulse of Economic Change: Displaced Workers of 1981-85," Monthly Labor Review, June 1987. Of the 10.8 million workers who lost jobs, the Bureau of Labor Statistics counts 5.1 million as displaced. Displaced workers were defined as those who had held their former jobs for at least 3 years. BLS uses the 3-year job tenure as a proxy for attachment to the labor force, reasoning that it is fair to count only those workers with full-time commitments to the workforce. The author, and OTA, generally use the larger figure of 10.8 million as the population of displaced workers, on the basis that job tenure is not used by any State as a criterion for eligibility for displaced worker services, and because there are some workers with a full-time commitment to the workforce who cannot hold jobs for three years. In this paper, however, data on proportions of workers displaced by industry are based on the BLS definition, because disaggregated displacement data are available only on this basis.

Industry	Number Displaced (1000s)	Percent of Displaced	Total (1000s)	Percent of Total	Ratio: Displaced/ Total
Total	5130	100.00%	109597	100.00%	
Nonagricultural pvt. wage & salary	4772	93.02%	97903	89.33%	1.04
Mining	175	3.41%	891	0.81%	4.20
Construction	316	6.16%	4481	4.09%	1.51
Manufacturing	2550	49.71%	19140	17.46%	2.85
Lumber & wood	104	2.03%	690	0.63%	3.22
Furniture & fixtures	63	1.23%	495	0.45%	2.72
Stone, clay, glass	87	1.70%	574	0.52%	3.24
Primary metals	235	4.58%	799	0.73%	6.28
Fabricated metals	187	3.65%	1447	1.32%	2.76
Nonelect. machinery	361	7.04%	2134	1.95%	3.61
Electrical machinery	255	4.97%	2182	1.99%	2.50
Transp. equipment	260	5.07%	1995	1.82%	2.78
Automobiles	148	2.88%	862	0.79%	3.67
Other transp. eqpt.	112	2.18%	1133	1.03%	2.11
Prof. & photo eqpt.	73	1.42%	723	0.66%	2.16
Other durables	66	1.29%	359	0.33%	3.93
Food & kindred	178	3.47%	1574	1.44%	2.42
Textile products	123	2.40%	698	0.64%	3.76
Apparel	171	3.33%	1118	1.02%	3.27
Paper & allied prod.	39	0.76%	683	0.62%	1.22
Printing, publishing	94	1.83%	1459	1.33%	1.38
Chemical & allied	98	1.91%	1027	0.94%	2.04
Rubber, misc. plastic	67	1.31%	795	0.73%	1.80
Other nondurables	88	1.72%	390	0.36%	4.82
Transp & public utilities	386	7.52%	5217	4.76%	1.58
Wholesale, retail trade	689	13.43%	23277	21.24%	0.63
F.I.R.E.	107	2.09%	6072	5.54%	0.38
Services	540	10.53%	22208	20.26%	0.52
Agricultural workers	141	2.75%	3163	2.89%	0.95
Government	172	3.35%	16617	15.16%	0.22
Self-employed, unpaid	33	0.64%	8531	7.78%	0.08

Source: BLS

fallen by 14,300. Most of the loss was borne by production workers, whose employment fell by 8,900, and the proportion of production workers in the industry fell by about half a percentage point, to less than 58 percent. This is certainly not dramatic, but consider: it occurred in just one year, and during a period of economic growth. In 1983, at the beginning of the economic recovery, employment in telephone and telegraph apparatus stood at 139,000, and production workers constituted 63 percent of the total. At its peak in 1979, employment in the industry was 165,400 workers, 70 percent of whom were production workers. These compares to a total of only 115,400 workers in May 1987, less than 58 percent of them production workers. Between the peak and the present, production employment dropped by more than the total, as the industry added white collar workers (Figures 1 and 2).

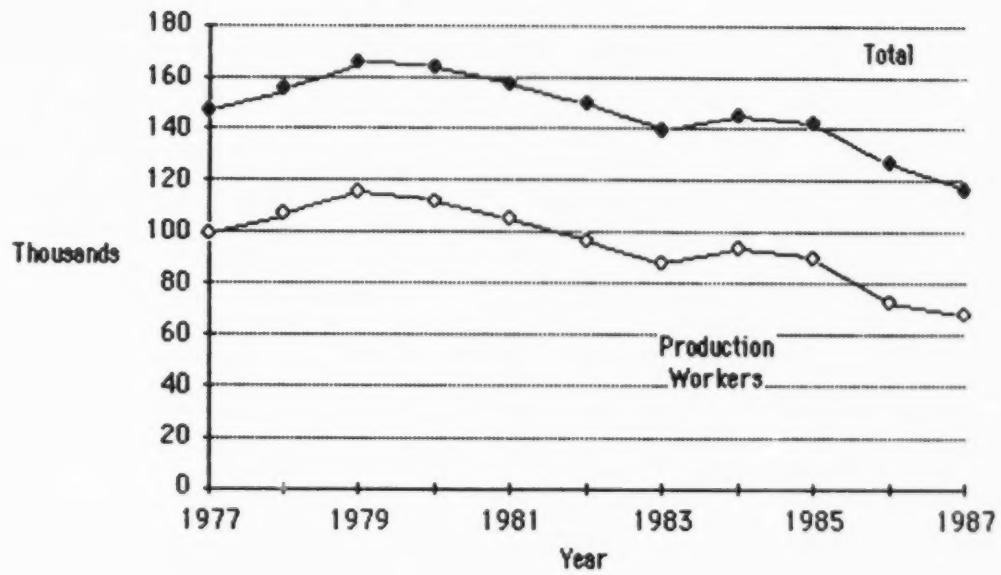
Displacement in manufacturing---and in telephone and telegraph apparatus---seems to be unperturbed by the economic recovery. This is expected, since the definition of displacement should exclude employment fluctuations due to economic cycles. Manufacturing employment has been--and probably will continue--on a long-run downward trend since 1979, something new in modern history. While manufacturing workers are not being forced out in droves, like many farmers and farmworkers during the Depression and the Dust Bowl, we are seeing a shift away from employment in manufacturing. What's behind it?

Causes of Displacement: International Competition and Automation

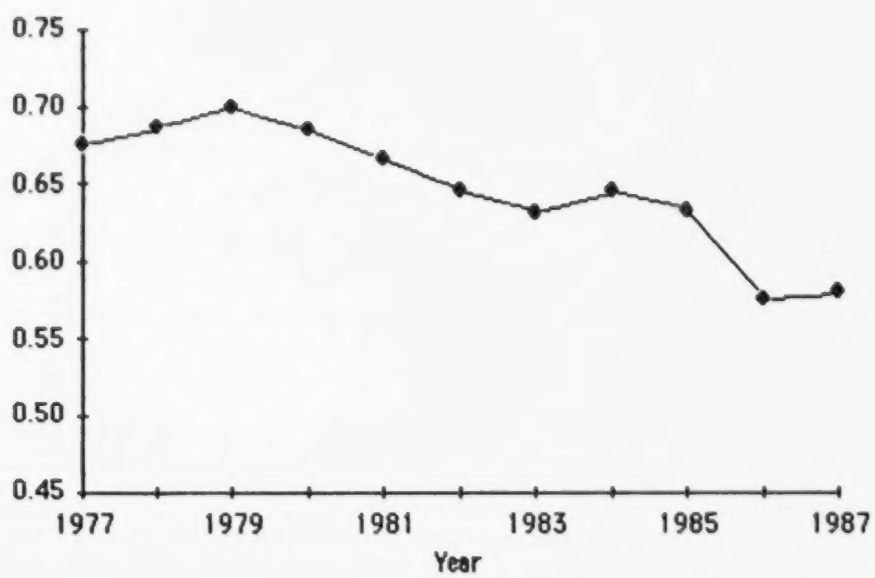
International trade has played an increasingly significant role in the economic life of America in the postwar period. Between 1960 and 1986, imports increased from 4.7 percent to 11.3 percent of GNP, while exports went from 5.8 percent to 8.9 percent. In the 1980s, in particular, growth of imports has outstripped exports, leaving the country with unprecedented current account and merchandise trade deficits. From a surplus of \$6.3 billion in 1981, the current account plummeted to a deficit of \$144 billion in 1986. The merchandise trade balance, or the balance on international trade in goods, reached nearly \$170 billion in 1986.⁵ The trade deficits are part of

⁵Trade deficits are reported as follows: the current account is as reported by the U.S. Department of Commerce, Bureau of Economic Analysis in Survey of Current Business. The merchandise trade deficit, as reported in the same source, is smaller: only \$149 billion in 1986. BEA reports both imports and exports on an f.a.s. (free alongside) basis.

Employment in SIC 3661



Percent Production Workers, SIC 3661



a larger macroeconomic scene on which the U.S. has rapidly shifted from the world's largest international creditor to the world's largest debtor, in terms of dollars.⁶ In terms of both international debt and international trade, the importance of the rest of the world to the U.S. economy has increased significantly, and the impact of trade on American workers has increased correspondingly.

When the relationship between trade and employment comes up, it is usually in terms of numbers of jobs. In the simplest terms, exports generate jobs and imports may cost jobs. Of course, nothing is ever quite so simple: because of rising productivity, exports generally rise faster than export-generated employment, and employment can fall even with increasing exports. Imports, on the other hand, may or may not cost people their jobs. to the extent that imports substitute for domestic production, there can be job losses. However, since some imports are either items not made in the U.S., or cost less than domestically-produced items, it is difficult to say just how much we would consume, or produce, in the absence of imports. Hence, it is equally difficult to say just how many jobs we lose to imports.

The only unequivocal statement about the relationship between trade and jobs than can be made with confidence is not very satisfying; that is: the deterioration in the international trade accounts in the 1980s has cost some jobs, although we cannot know how many. Between 1980 and 1984, according to estimates of the Department of Commerce, the number of jobs generated by exports fell from over 6 million to 4.5 million. Declining merchandise exports and rising productivity--or declining labor content of American exports--both contributed to the decline. Between 1980 and 1984, the labor content per billion dollars worth of U.S. exports decreased from 30,300 jobs to less than 25,000.⁷

The merchandise trade figures used in the text of this paper are those reported by the International Trade Administration, in U.S. Department of Commerce, International Trade Administration 1986 U.S. Foreign Trade Highlights, Office of Trade and Investment Analysis, March 1987. ITA reports exports on an f.a.s. basis, and imports on a c.i.f. (cost, insurance, and freight) basis, accounting for the difference between merchandise trade figures.

⁶In percentage of Gross National Product, the U.S. international debt is still quite modest compared to the debts of many developing nations.

⁷U.S. Department of Commerce, *Domestic Employment Generated by U.S. Exports*, International Trade Administration, Office of Trade and Investment Analysis (Washington, D.C., May 1983).

The employment effects of imports are less clear-cut. Imports do not cost job opportunities if the imported products are not produced domestically, or are produced in very limited quantities. For example, increasing imports of 256K DRAM semiconductor chips probably costs few jobs in the United States, as there are only two domestic producers, and it is doubtful that they could meet domestic demand in the short run. Products that are not made in the U.S. are called noncompetitive imports, and include many natural resource and mineral products and those based on proprietary or patented technologies.⁸ Probably the quintessential example is petroleum. The quantities that can be produced without imports are limited, and curtailing imports would undoubtedly cost many jobs in the United States.

There is also no job loss in industries where demand for the product is growing fast enough to accommodate rising imports as well as increasing or stable levels of domestic production. Between 1969 and 1985, for instance, imports of semiconductors increased from less than \$1.8 billion to \$8.5 billion. Because of the growth in demand, however, employment increased from about 75,000 to 279,000, a substantial, though less rapid, growth rate.

Not every industry has the luxury of the explosive growth in demand enjoyed by the semiconductor industry. Increases in demand are much more modest in most manufacturing industries, and where imports rise faster than demand, jobs can be lost. In some cases, the pace of change is sedate enough that job losses can be handled through turnover and attrition; in some cases, companies have been able to thin their ranks by offering attractive early-retirement programs. This is not always the case, unfortunately. One of the more spectacular examples occurred in the automobile industry, which lost over 216,000 jobs in just two years (1978-1980). Over 93 percent of the drop happened in 1979-80 alone.⁹ At about the same time (1977-1980), imported automobiles' share of new car sales in the U.S. increased from 18.6 percent to 24.1 percent. The losses left many midwestern states--notably, Michigan--with double-digit unemployment for several years thereafter.

⁸H. Peter Gray. "Non-Competitive Imports and Gains from Trade," mimeo.

⁹It is also important to note that these employment losses were persistent: real employment recovery did not begin until 1984, and by mid-1987, industry employment had recovered only 132,000 of the lost jobs, and employment trends had turned back down.

The Effects of Trade and Automation in Telecommunications Equipment

It is virtually impossible, in any industry, to tease apart the effects of automation or technological change and international trade. In part, this is because the decision to automate is often made in response to increasing international competitive pressure. Moreover, it is seldom clear what effects particular decisions will have on the workforce. For example, a company may locate production in a lower-wage country for the initial purpose of penetrating that market, and may find later that it is profitable to import the products made overseas into its home market.¹⁰ Thus, it isn't easy to judge whether a company is moving production to cut production costs, or to penetrate foreign markets, or both. Yet the two strategies can have different impacts on the workforce.

Nonetheless, it is sometimes possible to make judgements about the relative importance of technology and trade to industrial employment. In the telecommunications equipment industry, the importance of automation and trade vary depending on what market segment is involved. At the low end of the market--the less technologically advanced equipment such as telephone handsets and other less sophisticated Customer Premises Equipment--imports have played a major role in replacing domestic production. Imports from East Asian Nations--Taiwan, Hong Kong, Singapore, Korea, and other developing countries--consist largely of telephone instruments.¹¹ Some U.S. producers have been forced to curtail business, while others have moved production offshore. For example, in 1985, AT&T moved its telephone production plant from Shreveport, Louisiana to Singapore, displacing 1,800 workers.¹²

In more sophisticated products, automation plays a more important role in employment decisions. In a market driven by technological advances, automation confers many advantages: it helps to improve quality, it permits

¹⁰ For example, Honda originally built its Marysville assembly plant to establish a manufacturing presence in the American market--probably to help head off threats of domestic content legislation or other protection--but now, with the adjustment of the yen-dollar relationship, is talking about exporting cars made at Marysville to Japan.

¹¹ U.S. Department of Commerce, International Trade Administration, 1987 U.S. Industrial Outlook, (Washington, D.C.: U.S. Government Printing Office, January 1987), p. 30-4.

¹² Michael Schrage, "AT&T Announces Largest Layoff in Its History," *Washington Post*, Aug. 22, 1985.

relatively rapid changes in products manufactured, and can provide faster turnaround in the process of designing, testing, and scaling up production in new products. Inevitably, automation also reduces direct labor requirements.¹³ Also, the switch from analog to digital central switching equipment also means reduced labor requirements (Table 2).

Table 2: Employees Required for Manufacture of Central Switching Equipment¹⁴

Manufacturing Function	Total Number of Employees Required		
	Crossbar	SPC-Analog	Digital
Material: Components, Printed Circuit Boards, Metal FAB	1000	150	20
Assembly, Wiring	2000	900	50
Testing	250	200	50

Source: Jay Stowsky, "The Employment Effects of International Trade in the Telecommunications Equipment Industry," case study for the Office of Technology Assessment, U.S. Congress, April 29, 1985.

One factor worth noting, however, is that there has been less pressure to move production offshore in the more sophisticated market segments. Indeed, the need to tailor equipment to the specific needs of the customer, and maintain a strong service and manufacturing base in order to upgrade equipment, may make it necessary for foreign producers who want to go very far in the PBX market to locate production in the U.S. Certainly, import penetration in switching equipment has been far lower than in other market segments; in 1983, for instance, import penetration of the U.S. market for CPE

¹³Jay Stowsky, "The Employment Effects of International Trade in the Telecommunications Equipment Industry," case study for the Office of Technology Assessment, U.S. Congress, April 29, 1985.

¹⁴Estimates for a minimum size plant producing switches equivalent to 500,000 lines per year. Source: Arthur D. Little International, European Telecommunications--Strategic Issues and Opportunities for the Decade Ahead, Annex A: "Trends in Telecommunications Technology," November 1983. Cited in Stowsky, op. cit.

had reached 18.7 percent; for transmission equipment, 6.4 percent; and less than 1 percent in switching equipment.¹⁵ Where foreign producers do successfully compete in the U.S. switching equipment market, it is often by establishing manufacturing, distribution, sales and service networks here, as Northern Telecom has done.¹⁶ Overall, foreign direct investment in the U.S. (FDIUS) in radio, television, and communications equipment accounted for over 38,000 jobs in the United States in 1985.¹⁷

Similarly, American companies that wish to penetrate foreign markets may also find it advantageous to locate production there, or--a trend already manifest--establish joint ventures with firms in other countries to gain access to their telecommunications equipment market. However, while many steps have been taken to promote open international competition in the large overseas markets of Japan and European countries, it remains to be seen just how open such markets will eventually become to U.S. suppliers.¹⁸ In any case, it is unlikely that expanding into foreign markets will cost many U.S. jobs in the near future. Job losses are largely a result of automation on the part of domestic manufacturers of high-end equipment, and import penetration at the low end.

International Trade and the Education and Skills of American Workers

In addition to increasing impact on the number of jobs available, international trade can affect the kinds of education and skills workers must have in order to enjoy relatively stable worklives. While it is hard not to equivocate about the numbers of jobs the trade deficit has cost the U.S. economy, the effect on skills is quite clear: the greater the expansion of trade, the more precarious the worklives of semiskilled and unskilled workers, particularly in manufacturing.

Production workers--most of whom are semiskilled or unskilled workers--are much more likely to lose jobs than workers in any other occu-

¹⁵U.S. International Trade Commission, "Changes in the U.S. Telecommunications Industry and the Impact on U.S. Telecommunications Trade," Publication 1542, June 1984.

¹⁶Stowsky, op. cit.

¹⁷This is the finest industrial breakdown for which employment figures are available in statistics on foreign direct investment in the United States. It is likely that a substantial portion of the jobs are in telecommunications equipment.

¹⁸See, for example, Thomas R. Howell, Steven F. Benz, and Alan Wm. Wolff, "International Competition in the Information Technologies: Foreign Government Intervention and the U.S. Response," *Stanford Journal of International Law*, Fall 1986.

pational grouping. As a percentage of manufacturing employment, production employment has been shrinking throughout the postwar period. The losses have been somewhat more rapid since 1972--about the same time the U.S. started experiencing merchandise trade deficits. The drop was not particularly painful as long as manufacturing employment was increasing; however, since 1979, production workers have constituted a decreasing share of a shrinking sector, and nearly 2 million have lost jobs. Not all production workers are unskilled, of course. However, several years' experience with worker reemployment indicates that skilled workers are less likely to lose jobs, and much more likely to find new ones soon after displacement.

If production workers are a shrinking proportion of manufacturing employment, something must be increasing. The least skilled occupation, service workers, accounted for only 1.8 percent of manufacturing employment in 1980, and the proportion is still the same in 1987. Sales workers have increased their percentage of manufacturing employment modestly, from 2.2 percent to 3.3 percent since 1980. Clerical workers' share remained almost constant, from 11.5 percent in 1980 to 11.9 percent in 1987. The big gains have come in managers and officers, and professional and technical workers. Together, these three categories (which represent probably the most skilled and/or educated occupational groups) increased from 16.4 percent of manufacturing workers to 22.6 percent.¹⁹

These aggregate numbers point to a general increase in the skill and educational level of the manufacturing workforce. The contrast between manufacturing, where unskilled jobs are disappearing, and service sectors, where the numbers of unskilled jobs created in the 1980s has mushroomed,²⁰ is another indicator of the fact that manufacturing employment is under different pressures than service employment. It is true, of course, that the contrast is not a simple, black-and-white counterpoint. There are numerous examples of deskilling in manufacturing, and some of the fastest growing service occupations require advanced skills and education. How-

¹⁹U.S. Department of Labor, Bureau of Labor Statistics, Occupational Employment in Manufacturing Industries, Bulletin 2133 (Washington, D.C.: U.S. Government Printing Office, 1982); and U.S. Department of Labor, Bureau of Labor Statistics, Employment and Earnings, July 1987.

²⁰For example, see U.S. Congress, Technology and Structural Unemployment: Reemploying Displaced Workers, OTA-ITE-250 (Washington, D.C.: U.S. Government Printing Office), p. 364.

ever, both the aggregate information on occupational employment and a great deal of anecdotal evidence support the contention that manufacturing jobs at the low end of the skill spectrum are disappearing. Certainly, service providers at displaced worker projects find that it is easier to place skilled manufacturing workers than unskilled ones, except at substantial cuts in pay.²¹

How does international trade jeopardize less skilled manufacturing workers? American firms have responded to increased international competition in many ways, mostly aimed at reducing production costs. Some automate. If successful, automation programs result in improved productivity, which in turn puts downward pressure on employment. This pressure may result only in a damper on growth, or it may mean employment reductions, depending on the pace of growth in demand, output, imports and exports. Other companies, responding to increased competition engendered by trade, may emigrate, or move part or all of their production offshore to low-cost locations. In either case, the jobs most vulnerable are those of the less-skilled production workers. In the case of automation, these jobs are at risk because it is the simple, repetitive psychomotor skills that are often easiest to automate. And in the case of offshore production, the nations whose wage costs are lowest, and which usually offer the most attractive cost savings, are those with surplus unskilled labor. Operations which use the most unskilled or semiskilled production labor are most likely to be moved offshore.²²

Changes in the Composition of Employment, Job Quality and Skills in Telecommunications Equipment

Like other high-technology industries, the telecommunications equipment industry already has fewer than average semiskilled and unskilled workers, and a higher proportion of professionals and technicians. The competitive pressures placed on the industry have accentuated the trend toward higher skill and education levels, and displaced production workers. In electrical and electronic equipment (which includes telecommunications equipment), professionals and technical workers accounted for nearly 20 percent of industry employment in 1983, and managers and administrators

²¹ Ibid, Chapters 5. and 6.

²² Ibid, Chapter 9.

accounted for another 6 percent. These figures compared with 11 percent professional/technical and 5.8 percent managerial for all manufacturing.²³ Between 1977 and 1983 (the first and latest times the occupational employment statistics series were gathered by BLS) managerial workers increased 17.3 percent in the industry, professionals and technical workers 31.7 percent, and sales workers 71 percent, while total industry employment expanded by only 7 percent.

Examination of specific cases supports what the aggregate data suggest. Comdial, a company that built on its semiconductor expertise to enter the business of making high quality telephones, has chosen to deal with foreign competition by maintaining production in America and introducing state-of-the-art automation into its manufacturing process to cut costs. In the 2 years between 1982 and 1984, Comdial's engineering staff increased by a factor of 5, while its production staff suffered cuts of 40% (700 workers). The company has also moved its plant to Shenandoah, from Charlottesville, a distance of only 40 miles but enough to capture lower wage rates. The plant is still close enough to the Charlottesville headquarters to maintain rapid turnaround of product and production line innovations and requests for service, repairs, or upgrades.²⁴

Increasingly, companies in all parts of the market are sourcing the simplest products and components from abroad, and automating production in the U.S. wherever possible. In the more sophisticated product segments, it is desirable to maintain some domestic production, in order to provide service and upgrades, and develop, test and refine new products and process innovations. All of this means shrinking job opportunities for lower-skilled workers, and increasing demands for technicians and professionals.

Employment In Telecommunications Equipment: Pressures for Change and Outlook

²³U.S. Department of Labor, Bureau of Labor Statistics, Occupational Employment in Manufacturing Industries, Bulletin 2248 (Washington, D.C.: U.S. Government Printing Office, December 1985).

²⁴Stowsky, op. cit.

Like other manufacturing industries, telecommunications equipment has sustained displacement disproportionate to its share of the workforce, experienced declining employment levels since the peak in 1979, and has seen increasing upward pressure on the skill and educational levels of its remaining workers. The differences between what has happened and may happen in telecommunications equipment trade and employment and what happens in manufacturing as a whole are not trivial, though. Depending on one's outlook, telecommunications equipment may be viewed as ahead of the curve for other manufacturing industries, or a special case. It is "ahead" of manufacturing in that its trade deficit has increased faster--by more than 3,400 percent since 1981--and its production workforce has shrunk more in the 1980s. However, it is atypical in many ways, too. Telecommunications equipment trade is much more subject to the actions of governments than trade in most manufactures, and is more likely to be targeted for growth, development, and export on the part of developed and developing nations alike. It is also part of the industrial complex undergoing the most rapid technological change.

The things that will affect employment in the future are not much different than the things that have already shaped it. International trade will probably continue to be a net drain on employment, in two ways. First, aggressive competition from low-wage nations at the low end of the market--handsets and other CPE, for example--will probably continue to limit (or cut into) domestic employment. Aggressive competition from a variety of sources--European producers such as Alcatel-Thompson and Plessey, Northern Telecom from Canada, and Fujitsu, Hitachi and NEC from Japan, to name a few--will probably continue to provide plenty of incentive to automate production and digitize systems, which again puts downward pressure on employment while raising the skill and education requirements of those who are employed.

One of the few mitigating circumstances is that, in the technology-intensive products, there will still be pressure to locate production in America in order to compete effectively in the American market. Between 1981 and 1985, the number of U.S. affiliates of foreign companies in radio, television and communications equipment (which is, unfortunately, the most disaggregated industrial breakdown available) increased from 22 to 27, with total assets increasing from \$2.8 billion to \$3.8 billion. Employment of these affili-

ates increased marginally over the period, from 36,703 in 1981 to 38,217 in 1985.²⁵

While foreign competition will probably limit growth in American employment in telecommunications equipment on balance (and may limit actual numbers of employees as well), it is unlikely that American companies' expansion into offshore markets will compensate very much--unless limitations imposed by foreign governments on telecommunications equipment imports change are substantially reduced. So far, government intervention in or regulation of telecommunications equipment markets in Japan and European countries has tended to limit the market available to American suppliers, and even with some recent movement toward market-opening in Japan, it remains to be seen whether any real opportunities for expansion develop. Even if they do, the opportunities are unlikely to appear rapidly, and they may necessitate direct foreign investment by U.S. companies in offshore production, rather than exports.

While all of this may sound gloomy, it is important to remember that employment isn't the only barometer of economic success in an industry. It is likely that manufacturing employment as a whole will fall, but this doesn't necessarily mean deindustrialization, any more than falling agricultural employment over the 20th century was de-agriculturalization. To be competitive, particularly in an industry as volatile and dynamic as telecommunications equipment, requires constant improvement in productivity and product quality, and global sourcing and production to exploit markets. These may limit employment, but they will provide more employment--and more, to the point, higher-value-added jobs that can pay well--than would be available if we were to cede the competition to foreign suppliers, or lose the competitive battles.

²⁵U.S. Department of Commerce, Bureau of Economic Analysis, Foreign Direct Investment in the United States, Annual Survey Results, Revised 1981 Estimates, December 1984; and Preliminary 1985 Estimates, June 1987. The data on foreign direct investment in the U.S. are not altogether reliable; according to spokesmen from the Department of Commerce, they are "soft" data gathered through a census of companies every 5 years and an annual survey in between. However, they are the only available comprehensive data on the topic.

ATTN 5.70
Joseph Anderson and Suzanne Harris: Communications and Future
Employment Trends

ICF Incorporated has conducted a study of structural changes in the United States economy arising from new developments in communications technologies. The study was commissioned by the Bureau of Labor Statistics (BLS) of the Department of Labor to identify changes that might be required in the BLS' occupational employment forecasts. In the study, ICF assesses market and employment trends through the year 1995 in telephone equipment and services, electronic home entertainment equipment, radio and television communi-

cations equipment, and publishing. Communications-related employment trends are also discussed for the banking, insurance, and financial services industries; wholesale and retail trade; and Federal, State, and local government. Among the employment trends discussed are: declines in production jobs and in many clerical occupations and increases in such new occupations as information resources managers, industrial trainers, and video programmers for home electronic entertainment equipment.

COMMUNICATIONS AND EMPLOYMENT: WHO WINS, WHO LOSES

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By Joseph Anderson and Suzanne Harris, ICF Incorporated

At the request of the U.S. Department of Labor's Bureau of Labor Statistics (BLS), ICF Incorporated recently examined potential effects of communications technologies on the economic structure of the United States. Of particular interest to BLS were employment trends. The project was undertaken to update BLS' assumptions underlying official government forecasts of employment by industry and by occupation through 1995.

BLS relies heavily on mathematical models in forecasting employment but sometimes makes direct adjustments to reflect major technological changes. ICF's assistance was requested to supplement the judgement of the BLS economists who make these adjustments. This paper summarizes our findings and conclusions about future employment trends related to new communications technologies.

The project covered a broad spectrum of communications industries as well as several industries and sectors where communications technologies have strongly influenced operations. The industry categories and sectors that we examined were the following (see Exhibit 1 for descriptions of products and services that make up the industry categories):

- Telephone equipment and services
- Home entertainment electronics,

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EXHIBIT 1: INDUSTRY COMPOSITION AMONG PROVIDERS AND USERS OF COMMUNICATIONS

<u>Industry Category</u>	<u>Major Classes of Products and Services</u>
Telephone equipment and services	. Switching and switchboard equipment . Telephone instruments . Teleprinting and telex equipment . Other telephone and telegraph apparatus and parts . Telephone and telegraph services
Home entertainment electronics	. Radio and television receiving equipment for end users
Radio and television communication equipment	. Communications systems and equipment except broadcast, including fiber optics, radio communications equipment, space satellite communications equipment, mobile and citizens band (CB) radio, facsimile, and paging equipment, and antennas . Broadcast, studio, and related electronics equipment . Alarm systems, traffic control equipment and intercommunication systems . Search and detection and navigation and guidance systems and equipment . Other electronic equipment
Printing and publishing	. Newspapers, periodicals, books, miscellaneous publishing, commercial printing, greeting cards, and business forms
Banking, insurance, and financial services	. Banking . Credit agencies and investment offices . Security and commodity brokers and exchanges . Insurance carriers . Insurance agents, brokers, and service
Wholesale and retail trade	. All

Source: OMB, Standard Industrial Classification (SIC) Manual, 1987.

- Radio and television communication equipment (including virtually all radio and television devices except receiver sets),
- Printing and publishing,
- Banking, insurance, and financial services,
- Wholesale and retail trade, and
- Federal, state and local government.

ICF was asked to look for large-scale and potentially revolutionary impacts of technology, such as changes in commuting patterns resulting from workers' ability to do more work in their homes with communications-equipped computers. Ripple effects could be felt in many occupations (e.g., among transportation workers, automobile manufacturing employees, or providers of child care). Much of the literature on future impacts of communications envisions just such dramatic changes in working habits and lifestyles. In contrast, we found little evidence that communications will drastically alter either work or leisure between now and the year 2000. Our findings tended to confirm trends that we are observing today. We were impressed, however, by the strength and persistence of some of these trends and by their gloomy implications for many who will enter the job market over the next decade.

Employment Trends in Communications Products and Services

We began our analysis by reviewing literature on the economic effects of communications technologies to the year 2000. We hoped to identify important changes in the structure of the economy, that is, changes in consumer preferences, production processes and materials used, productivity of either labor or capital, or imports. Although the literature on communications technologies is wide-ranging, we discovered little analysis of broad economic impacts. This may be because communications innovations have occurred too fast since the Second World War for economists to separate communications from other sources of economic change, such as the overall rise in service industries and decline in manufacturing. Another possibility, as many industry analysts now report, is that the economic impacts of new technologies have only begun because most organizations are not yet exploiting the full potential of their office and factory automation tools, such as voice store-and-forward systems, high-speed data networks, and the like.

Finding macro-level data scarce, we redirected our attention from broad economic trends and towards economic impacts within specific industries. Here, we found better studies of changes related to new technologies, although most trend forecasts were heavily qualified, either because of radically new products or services (for example, sophisticated information services for home telephone subscribers) or because demand hinges on equipment interconnections requiring manufacturers to adopt industry-wide technical standards. Nevertheless, we found that most industry experts agreed on the direction of changes in output and employment in the industries

and sectors of concern to us, even though the experts do not necessarily agree on how fast the changes will occur.

As a frame of reference, we provide in Exhibit 2 data published by the Commerce Department on value of shipments, sales, and employment in 1982 and 1986 (or the most recent available year) for each industry category and government sector. Exhibit 3 contains a summary of the BLS' forecasts of annual percentage change in employment and ICF's recommendations concerning these forecasts.

Telephone Equipment and Services

Examination of recent market forecasts for telephone equipment and telephone services reveals several important trends:

- Strong growth in telephone equipment manufacturing as telephone companies and other organizations upgrade their switching systems,
- Even faster growth in demand for both business and consumer equipment, increasing amounts of which will be imported,
- Moderate to strong growth in demand for voice and data transmission services over the next three to five years, accelerating in the early to middle 1990s as technical standards become better established and as more organizations take advantage of high-capacity transmission equipment.

EXHIBIT 2: OUTPUT AND EMPLOYMENT IN COMMUNICATIONS AND USER INDUSTRIES

Industry Category	Output Measures: Value of Shipments or Sales (\$ Millions)				Employment (000)		
	1982	1986 est.	1986 ('82\$)	% Real Change	1982	1986	% Change
Telephone Equipment	13,394	20,745	18,980	+42	137	126	-8
Telephone Services					1,100	884	-20
Domestic	78,886	113,250	97,029	+23			
Int'l	2,325	3,620	NA	NA			
Home Entertainment Electronics	6,064	7,756	8,114	+34	48.4	47	-3
Radio and TV Communication Equipment	33,032	51,700	43,800	+33	464	591	+27
Printing and Publishing	79,798	118,432	99,393	+25	1,162	1,272	+9
Banking, Insurance, and Financial Services							
Commercial Banking (Assets)	1,820M	2,657M	NA	NA	1,507	1,565	+4
Savings Institutions (Assets)	867M	1,421M	NA	NA	343	449	+31
Insurance	-	-	-	-	546	554	+1
Wholesale Trade	1,155M	1,390M	NA	NA	5,278	5,823	+10
Retail Trade	1,072M	1,477M	NA	NA	15,258	16,261('84)	+7
Federal Government (Civilian)	-	-	-	-	2,848	3,021('85)	+6
State and Local Govts.	-	-	-	-	12,993	13,669('85)	+5

Sources: U.S. Department of Commerce, U.S. Industrial Outlook 1987 and
Statistical Abstract of the United States 1987

EXHIBIT 3: EMPLOYMENT TRENDS

	BLS Forecasts of Average Yearly Change Through 1995	ICF Recommended Adjustment To Forecast
Telephone Equipment	2%	Decrease
Telephone Services	1-2%	None
Home Entertainment Electronics	-1% to 0	None
Radio, TV Communication Equipment	2-2.5%	Increase
Printing and Publishing	1-2%	None
Banking, Insurance, and Financial Services clerical	1-2%	Decrease
Wholesale Trade	1-2%	
Retail Trade	1-2%	
Federal Government	0	None
State and Local Government	1%	None

The Commerce Department forecasts increases of 7 to 9 percent per year until the early 1990s in shipments of telephone equipment and in revenues to telephone service providers. From the early 1990s to the end of the century, several factors will continue to stimulate demand. One will be widespread adoption of industry-wide technical standards to resolve incompatibilities among different manufacturers' computer and communications devices. Another will be continued corporate mergers and consolidations, which should increase demand for communications services to achieve control over nationwide or international operations. Communications companies will also benefit as organizations contract out increasing amounts of work off-site, such as data entry tasks that can be performed outside of the United States at lower labor rates. Finally, as unit costs of communications decline, organizations can be expected to increase their usage of communications services, both for mass data transfer and for newer applications such as computer teleconferencing. Most communications companies plan to continue adding to their transmission facilities for at least the next several years.

The net effect on employment, however, will be no more than to stabilize jobs at their current levels. Employment in telephone equipment manufacturing declined from 137,000 in 1982 to 126,000 in 1986 and has continued to decline during the first two quarters of 1987 to 115,700. Improved productivity played a major role, as did increasing import penetration. Both factors are expected to continue depressing employment through the 1990s. Employment in telephone services has also been declining, due to innovations such as electronic switching units that require less labor to install and repair than electromechanical switches. Future growth in services may help to keep employment stable, but the large capital

investments currently being made by common carriers will further improve output per employee. Thus, it is not clear whether even employment in services will keep pace with revenue growth.

As shown in Exhibit 3, ICF accepted BLS' employment growth forecast of 1-2 percent per year for telephone services because revenues are expected to grow at least three times as fast. The skill mix in telephone services is likely to shift towards professional, technical, and sales occupations and away from clerical and craft occupations. This will occur because telephone companies will offer more diverse, competitive services such as high-speed data switching which can be tailored to users' exact needs.

We recommended that BLS re-examine its forecast of 2 percent per year employment growth in telephone equipment manufacturing, however, since we felt that BLS had underestimated the future impact of imports. The U.S. International Trade Commission expects import penetration of the domestic telecommunications equipment market (which includes cable and fiber optics) to increase from 10.8 percent in 1983 to 13.1 percent in 1993. The biggest increase is expected in customer premises equipment, which accounts for roughly one-half of the total market. In 1983, 18.7 percent of the customer premises equipment sold in the United States was imported. That figure is expected to increase to 21.2 percent in 1993. Customer premises equipment is currently the driving force behind market growth, as new devices such as call-screening telephones are introduced. Therefore, even if the market grows faster than currently anticipated, domestic manufacturing employment probably will not be helped because imports of customer devices and other equipment will be the high-growth products.

Home Entertainment Electronics

Innovations in home entertainment electronics, including high-resolution television and stereo television, improved audio and video recording and playback devices, and electronic accessories for cable television, are expected to continue appearing on the market at least into the 1990s. Imports' share of the U.S. market is currently over 60 percent and is expected to increase.

The employment outlook is generally pessimistic. Employment has declined from 76,700 in 1978 to 48,400 in 1982 and 47,000 in 1986, and BLS expects further declines or, at best, a leveling-off as imports continue to dominate the market. Innovations in home electronics may stimulate employment in related areas, however, especially in production of programming for video and sound playback devices. Most American homes now have videocassette recorders (VCRs), and the compact disk (CD) market is growing. More sophisticated devices such as CD-Interactive, or CD-I, diskettes can store music, speech, photographs, animated pictures and graphics, computer programs, and data. CD-I's are similar to videodiscs, now sold mainly for industrial training and education, but can be programmed by the user, like blank videocassette tapes. The growing installed base of home storage and playback devices is already creating a large unsatisfied demand for video programming. In the 1990s, high-capacity transmission channels, including cable television, fiber optics, and satellites, will be even more widely accessible as conduits for program transmission to the home.

Radio and Television Communication Equipment

Unlike telephone equipment and home electronics, radio and television communication equipment is a thriving domestic manufacturing industry. About one-half of total shipments are bought for military applications, and much of the remainder, including air traffic control systems and electronic navigation equipment, has found its way to civilian markets from the military. Military expenditures are the driving force behind the largest and fastest-growing category of radio and TV communication equipment: systems and equipment for search and detection and for navigation and guidance, which account for about 60 percent of industry shipments.

Substantial growth is expected over the next decade in the second-largest category, which includes fiber optics systems, space satellite communications equipment, radio transmission and receiving equipment, mobile and CB radio, facsimile and paging equipment, and antennas. Purchases of radio and television equipment for civilian as well as military applications are expected to grow faster than the economy through the rest of the century. Other important factors, besides military spending, will include continued growth in fiber optics systems and communications satellite capacity, as well as continued building and upgrading of cable television systems.

We agree with BLS that, in contrast to other communications industries, employment will continue to increase in radio and television communication equipment. Employment grew from 464,000 in 1982 to 591,000 in 1986. Even allowing for improved productivity, import penetration, and possible over-

capacity in satellites and fiber optic systems, employment growth probably will exceed the 2 to 2.5 percent per year forecast by BLS to 1995.

Printing and Publishing

Innovative applications of computer and communications technologies have revolutionized labor productivity in newspapers, periodicals, book publishing, and most printing businesses. The typesetting process was totally changed in the 1970s through computerized production of galley proofs. Production is continuing to become more automated, as new systems enable editors to lay out pages on computer screens and to integrate activities in the composing room, pressroom, and mail room. While overall employment has increased, production workers' share declined from 49 percent in 1970 to 38 percent in 1986. Further declines are expected as more companies implement production innovations.

Technological innovation will eventually make even more fundamental changes. Newspapers and magazines face increasing competition from radio and television and other electronic media including data base information services. Many publications are attempting to pre-empt potential competitors by starting their own data base services or by contributing information to other services. Although consumer demand may not be widespread, electronic publishing is expected to become more popular as more consumers become familiar with personal computers and as cost differentials between paper and electronic communications become larger and more apparent. It is too soon to predict the impact on employment. At present, we accept BLS' forecast (see Exhibit 3).

Banking, Insurance, and Financial Services

Market opportunities were important factors motivating introduction of new information technologies in financial services organizations during the 1970s. High interest rates and high inflation stimulated demand for services by which consumers could manage their assets more effectively than through conventional savings and checking accounts. When banking deregulation went into effect, many banks and savings institutions also began offering brokerage services and insurance. Digital switching and other information technologies that matured during the 1970s gave financial services institutions the data-handling and high-speed transmission capabilities to offer these services. Transmission of financial data among countries also became faster and cheaper, further broadening the range of investment opportunities and strengthening, for better or worse, the international ties among financial markets.

These changes stimulated asset growth and overall employment in financial services industries. At the same time, automation of many office functions through computers and communications has reduced the proportion of clerical workers and may eventually help to stabilize or reduce employment in these industries. Based on a large-scale survey of industry experts, a researcher at the Georgia Institute of Technology has predicted that clerical employment will decline by 22 percent in the insurance industry and by 10 percent in the banking industry between 1980 and 2000. These two industries together employed more than 20 percent of all clerical workers in 1980; the anticipated changes could reduce total clerical employment in the U.S. by

three percent. In the short term, however, the expansion of financial services seems likely to outweigh the productivity-enhancing effects of communications and computers. This leads us to support BLS' forecast of 1-2 percent average yearly growth to 1995.

Wholesale and Retail Trade

Communications technologies are changing many operational characteristics of wholesale and retail organizations. Catalog merchandisers are looking for opportunities to offer products through computer data bases, at least experimentally, and televised home shopping programs are attracting the interest of large merchandisers such as Neiman-Marcus. Both wholesalers and retailers are becoming better-prepared for these changes with communications-equipped computers in their warehouses that can accept orders and can also manage inventory, handle materials, and schedule delivery routes. Wholesalers are gaining skills in telephone marketing, improving the productivity of sales workers.

Most communications technologies used in wholesale or retail trade fall into the following categories: office automation; point-of-sale devices for immediate verification of credit card purchases; new approaches to product development, marketing, and customer service based on information technologies; and teleshopping, in which computers and communications are used to place orders electronically. An example of new business approaches is found among wholesaler-distributors of pharmaceuticals, who have increased their market share since 1970 from 45 percent to 65 percent (manufacturers

lost a comparable share) through automated placement and processing of orders from pharmacies, drugstores, and hospitals.

The prospects for improved productivity through automation led us to question whether BLS' employment forecasts of 1-2 percent annual growth might not be too high. Whatever happens, the composition of employment will probably change. Technical employment should increase as the establishment and maintenance of communications networks become more crucial to organizations' performance. The proportion of the work force in sales also should increase as wholesalers rely more on telemarketing, which costs less than in-person sales calls. Because telemarketers record orders at the moment they are placed, clerical employment will probably decrease.

Federal, State, and Local Government

Government agencies are major purchasers of communications equipment and services. Military purchases account for about one-half of total purchases of radio and television communication equipment and about 10 percent of purchases of telephone and telegraph services. The Electronic Industries Association (EIA) anticipates 15 to 17 percent annual real growth in the overall defense telecommunications market from 1984 to 1989 as the Defense Department replaces outdated communications equipment and systems. The EIA expects that by 1989, telecommunications will account for almost 60 percent of total Defense Department electronics expenditures.

Office automation is also contributing to government demands for communications. The Paperwork Reduction Act of 1980 requires the Federal

government to take steps to make its offices more productive. Each agency now has an information resources manager who is responsible for preparing overall plans for implementing computer and communications technologies. The agencies' projections frequently include a 15 percent potential savings from increased productivity. The figure is high but is related to the intensively white-collar nature of Federal government work. About 80 percent of the Federal work force is white-collar, compared with about 55 percent of the total civilian work force.

Office automation has already changed Federal office work. Since 1975, the number of workers classified as "general administrative, clerical, and office services" has declined by eight percent. This group contains about one-fourth of all Federal workers. Overall, the Federal work force grew by only 2 percent from 1970 to 1980, and the staffing ratio now includes more technical, administrative, and professional employees and fewer clerical employees than before. BLS anticipates no significant growth in Federal employment to 1995.

State and local governments, which represent over 80 percent of total employment in the public sector, have lagged behind the Federal government in automation but now are considered the largest single market for microcomputers. Most large cities have implemented microcomputers, and many medium-sized and small cities are beginning to do so. States are difficult to discuss categorically because few states have central planning and procurement strategies for information technologies except for mainframe computers. Nevertheless, many state agencies are undertaking automation

projects, which should help to control future increases in employment. We, therefore, accepted BLS' forecast of 1 percent growth per year.

Conclusions

Our examination of communications industries led us to conclude that, although total output will grow faster than the economy as a whole over the next decade, employment growth may be only average. In telephone equipment, telephone services, and home entertainment electronics, employment will probably be static or may continue to decline. Employment in radio and television communication equipment will probably increase, but much depends on future military spending. Among several industries that are large users of communications equipment and services, we found that communications are helping to transform operations, opening new markets and improving productivity. The impact on employment, however, has not been as great as in communications. Their output and employment over the next decade probably will be close to the average for the overall economy. Government employment may remain stable or, if it grows, will not exceed growth in the economy overall.



ICF INCORPORATED

ICF Incorporated is a nationwide professional and technical services firm with headquarters in Fairfax, Virginia. ICF's staff of 900 includes economists, engineers, and policy analysts. Since its organization in 1969, ICF has worked for almost all major Federal agencies, including the Department of Energy, the Department of Labor, Environmental Protection Agency, and Internal Revenue Service, Federal and state regulatory commissions, as well as many private sector clients, including trade associations and telecommunications companies.

Joseph Anderson is a Vice President of ICF. Dr. Anderson is an economist specializing in modeling and forecasting developments in the U.S. labor markets, population, and economy, especially as they affect industries and public sector programs. He has a Ph.D. in economics from Harvard University.

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COMMUNICATION & FUTURE EMPLOYMENT TRENDS
Chair: Christopher Sterling

Richard S. Belous: The Telecommunications Industry, Contingent Workers, and the House of Labor

The telecommunications industry should be a growing source of employment in the economy, but the structure of this employment will experience dramatic changes. More of the telecommunications industry's human resource demands will be filled by contingent workers (i.e., workers who have only a weak affiliation with a major company in the industry). Contingent workers, unlike a corporation's core work force, have no long-term implicit contracts with an employer and are not part of the corporate family. By using more sub-contracting, part-time and temporary workers, and self-employed people and consultants, telecommunications firms will be able to reduce the relative size of their core work force. Estimates presented in this paper indicate that this process has already started.

This contingent worker strategy will help many telecommunications firms reduce their labor costs and increase their productivity. But it will also create several new problems including: increased resentment by some workers and managers. It will also create new problems for unions in the industry because it is harder to unionize a contingent work force compared to core workers. In this new "information age" one would expect that unions in the telecommunications industry would become the "leaders" within the house of labor (similar to steel and auto unions in the "industrial age"). However, the growth of contingent work forces will make it very difficult for telecommunications unions to carry out this leadership role.

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THE TELECOMMUNICATIONS INDUSTRY, CONTINGENT WORKERS, AND THE HOUSE OF LABOR

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By Richard S. Belous 1/

Beyond Aggregates

If all one looked at were aggregate numbers, then the human resource future of the telecommunications industry might be quite smooth. The industry should be a source of some employment growth within the economy for the rest of the century. However, the structure of employment within the telecommunications will experience dramatic changes. In general, these structural changes will be as follows:

- More of the telecommunications industry's human resource demands will be filled by contingent workers, and;
- Many telecommunications firms will reduce the relative size of their so-called core work force.

This shift will have a major impact on not only the telecommunications industry, but it will also have a significant effect on labor management relations in America. As a labor economist with The Conference Board, I am currently conducting research on labor market flexibility. While U.S. labor markets at one time were quite rigid, the evidence indicates that they have become much more flexible in recent years. Economic forces, for example, currently have a much greater impact on U.S. labor market results than they had in, say, 1976. 2/

A key part of this flexibility research has centered on the use of so-called core and contingent work forces. Again, this research remains "work in progress." There are many point which I will make about U.S. labor markets in general. Much of the "hard" evidence concerning contingent workers and specific industries still remains to be gathered. However, some aspects of the contingent work force can not be examined on the industry level given current data sources and real world research budgets. Nevertheless, I believe that enough evidence exists to raise questions and to make several qualitative predictions.

The bottom line is that management and labor within the telecommunication industry will have to deal with numerous contingent worker issues. This means that aggregate numbers on industry employment levels will not show one significant parts of the altering industry picture.

Employment Totals

For what it is worth, analysis based on leading input-output models indicates some increases in telecommunications industry employment between now and the year 2000. Of course, employment totals depend upon what is considered to be part of the telecommunications industry. Economists have often not agreed on which specific areas of the economy should, or should not, be included in industry counts. The estimates presented in Table 1 indicate that telecommunications industry employment should be growing in the 1986 to 2000 period. However, this job growth could be quite moderate compated to job growth in the rest of the U.S. non-farm economy.^{3/}

Table 1. Telecommunications Industry Employment ^{a/}
(Thousands)

	<u>1986</u>	<u>2000</u> ^{b/}	<u>Percent Change</u>
Radio and TV Communication Equipment	505	542	+7.3
Electronic Components and Accessories	630	675	+7.1
Communications	<u>1,279</u>	<u>1,222</u>	<u>-4.5</u>
Industry Total	2,414	2,439	+1.0
Total Non Farm Employment	111,623	133,030	+19.2

^{a/} U.S. Bureau of Labor Statistics estimates based on input-output model analysis.

^{b/} Based on moderate growth assumptions used by the Bureau of Labor Statistics.

One could produce more "liberal" estimates of telecommunications industry job growth if more parts of the economy were included in the totals. Also, one could use so-called "high growth" assumptions (instead of the "moderate growth" assumptions that were employed) in forming Table 1 estimates. This would alter the level of telecommunications industry employment-- but it would not alter several basic qualitative realities the industry faces, including:

- Many telecommunication firms will remain under intense cost and profit pressures due to deregulation, international economic forces, hot financial markets, and technological changes;
- Given these intense competitive pressures, telecommunication industry firms will try to boost their profit levels and productivity rates.

While it is not the only way to boost profits and productivity levels, holding the line on the growth of human resource costs is often the strategy picked by U.S. managers. Thus, all of the above pressures will be working to restrain employment growth rates within the industry. Estimates produced by using an alternative input-output model (built by Nobel laureate Wassily Leontief and Faye Duchin) generate different specific employment levels compared to the BLS estimates. Nevertheless, the estimated general industry employment trends remain the same. Employment in the telecommunications industry should continue to grow for the rest of this century. But the industry growth rate could be lower than the total rate for the non-farm economy. 4/

To give a sense of how current economic forces are working to restrain telecommunications industry employment growth rates, Andrew W. Wyckoff (of the U.S. Office of Technology Assessment) and I recently examined how international trade influences employment within various industries. Again, using an input-output model of the U.S. economy, we looked at what happens

to industry employment when the economy experiences an increase in both \$10 billion worth of exports and imports. As indicated in Table 2, the telecommunications industry in America experiences a net job loss under these conditions of international trade. Thus, if one believes that telecommunications will become more "internationalized," then this could restrain the growth of telecommunications industry employment in the U.S. 5/

Contingent and Core Workers

Besides total employment levels, analysts should look at shifts in the structure of telecommunications industry employment. In general, as noted the key change for the industry will be the growth of a so-called contingent work force and a relative decline in the industry's core work force. Before presenting the reasons for the above predictions, I would like to explain the concepts of contingent and core work forces in detail.

Management has to make several very basic decisions in building its corporate work force. As undergraduate students are informed, economics deals with several basic questions that all societies, companies, households, and government face: (a) What is to be produced? (b) How is it to be produced? (c) How is it to be distributed?

The concepts of core and contingent work forces center in on the second basic economic question. Management can decide to produce goods and/or services by using many workers who have a very strong affiliation with a company. To use the language of labor economists, an employer can make an implicit (or even an explicit) contract with a group of workers concerning a long-term relationship. These workers would be significant stakeholders in a company, and they would be part of the corporate family.

Table 2. Telecommunications Industry Employment Changes
Due To \$10 Billion Worth of Exports and Imports ^{a/}

	<u>Net Job Change</u>
Radio and TV Communications Equipment	-3,200
Electronic Components	-1,500
Communications, Except Radio and TV	+1,200
Radio and TV Broadcasting	<u>+ 200</u>
Total	-3,300

^{a/} Estimates based on The Conference Board and U.S. Office of Technology Assessment input-output model of American economy.

However, management could also decide to use many workers who do not have a strong affiliation with a company. These would be individuals who lack a long-term implicit contract, and they would not be significant stakeholders in the company. Also, these types of workers would not be part of the corporate family.

As indicated in Figure 1, core workers have a very strong affiliation with their employer; they have a long-term implicit contract; and they are part of the corporate family. Contingent workers do not have strong affiliation with their employer; they have no long-term promises; and they are not part of the corporate family.

What are some of the major benefits and costs of contingent workers:

On the benefit side:

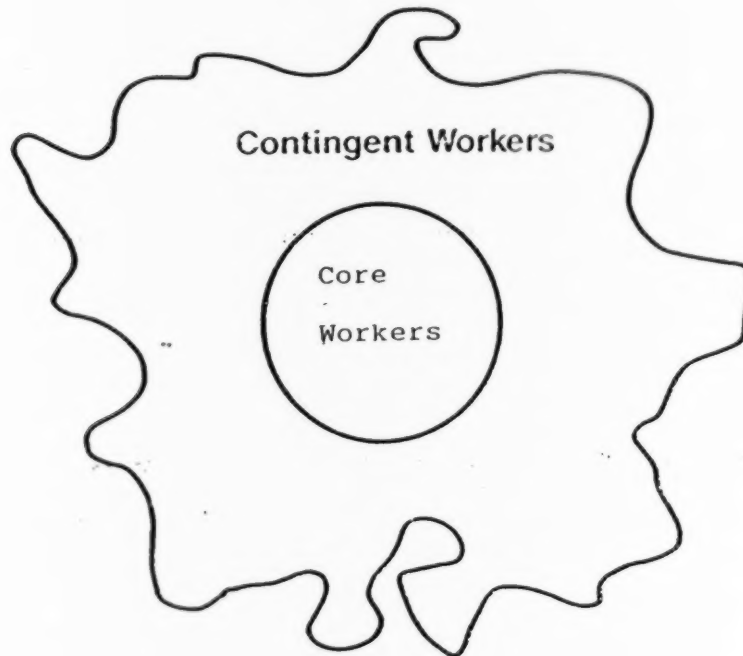
- They may help a company keep its human resource costs down;
- They could increase a company's flexibility in responding to rapid shifts in the market, and;
- They may help a company to improve its competitiveness.

On the cost side:

- A growing contingent work force could reduce worker loyalty to an employer;
- It may create more tensions and resentments between management and labor, and;
- It may create a situation in which there is an under-investment in workers of, what economists call, human capital (i.e. skill and training development).

Despite one's feelings about the above benefits and costs, many employers in the 1980s have reduced the size of their core work forces. At the same time, many employers have expanded the relative size of their contingent work forces. Measuring the size of the contingent work force is a slippery business at best. Nevertheless, it can be estimated by looking

Figure 1. Contingent and Core Workers



Contingent Worker

- Weak affiliation with an employer
- Lacks an implicit long-term contract with an employer
- Not a significant stakeholder in the company
- Not part of the corporate family

Core Worker

- Strong affiliation with an employer
- Has an implicit long-term contract with an employer
- A significant stakeholder in the company
- Part of the corporate family

at the growth of specific types of workers. As shown in Table 3, between 1980 and 1986 the total contingent work force increased at about twice the rate of the total civilian work force.

This means that so far in the 1980s, more than half of the net job growth has been in the ranks of contingent workers. Contingent workers can be considered to be temporary workers, part-timers, business services, and the self-employed. By 1986, the contingent work force represented about 29 percent of the total U.S. labor force. Given the forces noted above, a growing contingent work force should be a major human resource reality well into the 1990s.

Telecommunications and Contingent Workers

As indicated before, the estimates of contingent workers come from "work in progress." I wish I could now say that the size of the contingent work force within the telecommunications industry has increased by a given percentage figure within the 1990s. So far I can not do this. Nevertheless, the evidence of a growing contingent work force within the industry does exist.

For example, consider Table 4. These estimates show what percent of total output by a given industry was produced by that industry. For example, in 1967 the radio, TV and communications equipment industry was responsible for 45 percent of the value added in products sold by that industry. Thus, suppose equipment produced by this industry cost, say \$100. In 1967, the radio, TV and communications equipment industry would have been responsible for \$45 of the value added in that equipment. In other words, \$55 (i.e., \$100 minus \$45) would represent the value added by other industries.

Table 3. Growth of the Contingent Work Force a/
(Millions of Workers)

	<u>1980</u>	<u>1986</u>	<u>Percent Change</u>
Temporary Workers	.4	.7	75%
Part-Time Workers	16.3	19.5	20
Business Services	3.3.	4.8	45
<u>Self-Employed</u>	<u>8.5</u>	<u>9.3</u>	<u>9</u>
Total Contingent Work Force	28.5	34.3	20
Total Civilian Labor Force	106.9	117.8	10

a/ Estimates based on Bureau of Labor Statistics data.

Table 4. How Much of Total Industry Output is Produced
by a Given Industry? a/

(Percent)

<u>Industry</u>	<u>1967</u>	<u>1972</u>	<u>1977</u>	<u>1980</u>
Radio, TV and Communications Equipment	45.0 %	46.3 %	46.1 %	36.3 %
Electronic Components	44.7	49.3	46.8	33.3
Radio and TV Broadcasting	49.6	52.6	58.8	56.6

a/ Thus, in 1967 the Radio, TV and Communications Equipment industry actually produced 45% of the value in the products it sold, and 55% of the value was added by other industries. Based on input-output model estimates by the U.S. Office of Technology Assessment.

As an industry "farms" (i.e., subcontracts) out more work to other industries, and as it uses more business services (and in some cases other types of contingent workers), the percentage figures in Table 4 will fall. Thus, an industry that used no business services, and so forth, might have a percentage figure which was closer to 100 percent. On the other hand, if an industry farmed out almost all of its work, and used many different forms of contingent workers, then the percentage figures in Table 4 would be very low.

As can be seen in Table 4, several parts of the telecommunications industry saw increased value added percentage figures between 1967 and 1977. However, between 1977 and 1980, these percentage figures declined-- which shows that more work was "farmed" out. Currently, 1980 is the last year in which these types of estimates can be made. However, given the percentage for radio and TV broadcasting in 1980 (56.5 percent), this sector of the economy seems to have been just ready to experience the kind of contingent worker strategies that would reduce this figure.

The financial press has carried numerous stories about the growth of contingent workers within the telecommunications industry. Many of these examples have followed deregulation and/or corporate raider activity. While this may not be considered hard scientific evidence, it appears to be a significant sign. I would expect that when the estimates contained in Table 4 can be updated into the 1980s, we will find that the value added percentage figures have fallen, and subcontracting will be way up. Also, other types of contingent workers will show up in the telecommunications industry, I believe. These issues have played a key role in recent labor-management disputes within this industry. 6/

Many employers and workers may like the older model which contained a larger core work force. But new economic realities will drive more telecommunications firms in the direction of contingent worker strategies.

The Impact on Unions?

Suppose the above predictions are correct and contingent work forces grow within the telecommunications industry. What will be the impact on the labor movement?

First, it appears to be harder to unionize contingent workers than it is to unionize core workers. There may be many workers within the industry who have a high degree of resentment. But given the nature of contingent work forces, it could prove to be quite difficult to unionize these workers.

Second, the growth of contingent work forces within the telecommunications industry will influence who will be the flagship unions within the labor movement. A flagship union is a union that is a clear leader within the ranks of the labor movement.

In the industrial age the steel and auto worker unions were the flagship unions within the labor movement. In a growing economy which experiences a good deal of change, it is reasonable to expect that flagship industries will change. Flagship industries are the leading economic sectors of a given period. In an era when the railroad was the flagship industry, one would expect that railroad unions would have been the labor movement's flagship unions. As the railroad age passed into the industrial auto age, one would have expected a union that represented auto workers would have been in the flagship position. These changes did, in fact, happen within the labor movement.

As we move from a world in which autos and steel are flagship industries into one in which computers and telecommunications are flagship industries (i.e., the so-called information age), one would expect that a different union and/or unions would take on labor movement's flagship role. The real problem for labor is not the decline in the steel and auto unions. The real problem is the lack of union growth within flagship areas of the economy.

The increase of contingent work forces within the telecommunications industry could weaken unions within this industry. In a real sense this will happen at the very same time that unions within the telecommunications industry should be taking over the flagship role of the entire labor movement. Thus, the growth of contingent work forces within the telecommunications industry will not only effect labor-management relations within this industry, but it should have a very significant impact on the entire house of labor. For telecommunications unions, it will be quite difficult to be flagship unions when so much of their time is spent bailing out of water.

This is not to say that telecommunication unions will never take on a flagship position. In the next few years, however, the chances that this will happen appear to be slim as telecommunications unions fight a difficult battle in very rough waters. The labor movement still has not found any new union and/or unions that can take on the flagship role in this brave new economy.

Footnotes

1. Richard S. Belous is a senior research associate and labor economist for The Conference Board. The views expressed in this paper are his own and do not necessarily reflect those of The Conference Board.
2. Richard S. Belous. "Flexibility and American Labour Markets: The Evidence and Implications." International Labour Office, Working Paper Number 14. June 1987.
3. U.S. Bureau of Labor Statistics. Employment Estimates For The Year 2000. USDL 87-258. Also see: William B. Johnston. Workforce 2000: Work and Workers for the 21st Century. Indianapolis, Indiana: The Hudson Institute. 1987; and Audrey Freedman. Perspectives On Employment. New York: The Conference Board, 1986.
4. Wassily Leontief and Faye Duchin. The Impact of Automation on Employment, 1963-2000. New York: Institute for Economic Analysis of New York University. April 1984.
5. Richard S. Belous and Andrew W. Wyckoff. "Trade Has Job Winners, Too." Across the Board. September 1987.
6. For example, see: "Kirkland Raps NBC Static on 'Final Offer,'" AFL-CIO News. August 29, 1987. pp. 1, 6.